

Chapter B6: Threatened and Endangered Species Analysis

INTRODUCTION

This chapter develops potential methods for the estimation of non-use values for special status species in California.¹ Non-use value estimates are particularly relevant for these species. Their populations have been depleted to the point where active use values based on previous studies would be misleading because of fishing restrictions or decreased effort or participation due to low catch rates.

Regulation-specific stated preference surveys are the preferred way to directly estimate total values (including use and non-use) for special status species. Such a survey has not been undertaken because it could not be completed within the time frame for the rulemaking process. Despite potential difficulties associated with benefit transfer approaches, if properly done they can constitute a second-best alternative to original stated preference studies to value improved protection of special status species. Chapter A13 of this report provides a detailed description of the benefits transfer approach used in this analysis. Section B6-2 describes the benefit transfer studies used in the analysis and presents analytic results.

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B6-1 A POTENTIAL METHOD FOR VALUING SPECIAL STATUS SPECIES

B6-1.1 Overview of Method

This method is based on the premise that under specific circumstances it is possible to infer how much value society places on a program or activity by observing how much society is willing to forego (in out-of-pocket expenses and opportunity costs) to implement the program. For example, the costs borne by society to implement programs that preserve and restore special status species can, under select conditions, be interpreted as a measure of how much society values the outcomes it anticipates receiving. This is analogous to the broadly accepted revealed preference method of inferring values for private goods and services based on observed individual behavior.

In the case of observed individual behavior, when a person willingly bears a cost (pays a price) to receive a good or service, it is deduced that the person's value for that acquired good or service must be at least as great as the price paid. This observation is, based on the presumption that individual behavior reflects the economic rationality of seeking to maximize utility (well-being), the person's willingness-to-pay (WTP) must exceed the observed price paid, otherwise they would not have purchased that unit of the commodity. The approach described in this section uses the same premise, but applies it to societal choices rather than to a single individual's choices.

A critical issue with the approach is determining when it is likely that a specific public sector activity (or other form of collective action) does indeed reflect a "societal choice." EPA recognizes clearly that not every policy enacted by a public sector entity can rightfully be interpreted as an indication of social choice. Hence, the costs imposed in such instances may

¹ Consistent with the discussion in Chapter A13, "special status species" is the term used to refer to species that have been specifically identified as "threatened and endangered" (i.e., T&E) or that have been given a special status designation at the State or Federal level.

not reveal social values. For example, some regulatory actions may have social costs that outweigh the social benefits, but may be implemented anyway because of legal requirements or other considerations. In such a case, asserting that the costs imposed reflect a lower bound estimate of the “value” of the action would not be accurate (the values may be less than the imposed costs). Alternatively, there are some regulatory programs for which the benefits greatly exceed costs, and in such instances using costs as a reflection of value would greatly understate social benefits.

There are some public policy actions that can be suitably interpreted as expressions of societal preferences and values. In these instances, the incurred costs may be viewed as an indication of social values. The criteria to help identify when such situations arise include whether the actions taken are voluntary, or whether the actions reflect an open and broadly inclusive policy-making process that enables and encourages active participation by a broad spectrum of stakeholders. This is especially relevant where (1) plans and actions are developed in an inclusive, consensus-building manner; (2) implementation steps are pursued in an adaptive management framework that enables continuous feedback and refinement; or (3) the actions are ultimately supported by some positive indication of broad community support, such as voter approval of a referendum. In such instances, the policy choices made are the product of a broad-based, collective decision-making process, and such programs should be viewed as an expression of societal preferences. When programs or activities stem from such open collective processes, the actions (and costs incurred) reflect the revealed preference of society.

This approach incorporates the basic economic principle that holds a resource’s value is defined in terms of its opportunity costs. The method builds on this principle by recognizing that public agencies and private individuals voluntarily and/or through a broad-based collective decision-making process undertake a range of actions intended to maintain or increase the populations of fish stocks, and that often these actions are directed to improve the stocks of special status species. As a result, the costs involved with implementing these actions, combined with the value of any foregone opportunities that need to be committed to the action to ensure its success (even if they may not involve a direct expenditure, e.g., maintaining instream water flows), can provide an estimate of the value of the intended improvement in the species population.

A key criterion for a project to be considered an expression of public values is that the project be voluntarily undertaken so that any costs and foregone opportunities provide a true indication of an opportunity cost of the action being realized. For projects undertaken by private individuals and organizations, it is assumed that this criterion is satisfied unless there is evidence that the action is undertaken to satisfy a strict regulatory compliance requirement or a mandated court requirement. For actions of public agencies to be considered, this criterion is assumed to be satisfied when the action is taken in response to legislative mandates that have been widely supported by lawmakers and/or the public (e.g., as evidenced by broad stakeholder involvement, especially in a consensus-oriented decision-making context, and/or where funding is supported by voters through referenda, such as evident in the CALFED process), or where the action has been approved through an internal project screening and selection process designed to allocate limited resources. In the second case, while subtle, the criterion is assumed satisfied if there were alternative projects/actions that could have been pursued but were not, as this provides evidence that an opportunity cost was involved with the selections that were made.

A second criterion that needs to be satisfied for a project to be considered in the analysis is that the project objectives and actions have a clear link to the resource being valued. In some cases the actions may be directed at a targeted group of resources (e.g., California condor population support programs clearly are targeting California condors). However, in other cases a project may benefit a number of resources outside of the scope of the valuation analysis. In these cases, it is necessary to determine whether the full scope of the activity was required to benefit the resources of concern or whether there were additional benefits. For example, if a certain level of instream flow may be required by a special status species, actions taken to maintain flows at this level because of the species would be appropriate for consideration in the analysis. However, if flows were increased above the level required by the species to provide additional benefits (e.g., improved downstream kayaking), only the share of actual costs or foregone value associated with the portion of the release required for the special status species should be considered.

The economic foundations for using this approach to value T&E species are firmly established through the widespread recognition and acceptance of revealed preference data as a source of nonmarket information that is acceptable for the valuation of resources. In EPA’s approach, valuation estimates rely on the costs of actions or the value of foregone opportunities that are *voluntarily* undertaken or that have been approved through extensive public input and review (and developed in a consensus-oriented approach). With these sources of data, the method avoids the well-established problems associated with using “costs” as a measure of “value” — a problem that can arise when the cost is realized involuntarily (e.g., avoided cost-based measures of value). Specifically, because of the available evidence of the public’s acceptance and willingness to incur the opportunity costs associated with the actions that are selected for evaluation, the fundamental criteria for defining the value of any resource are satisfied.

It is important to note that one issue that arises with the use of this method is that it is not clear that the resulting values can be distinctly categorized as direct use or non-use values because the underlying actions benefitting the T&E species could reflect an expressed mix of non-use values (e.g., preservation and existence) and discounted future use values (e.g., the actions are seen as an “investment” that could return the species to levels at which direct use would be permitted).

The principle source of information that can be used to determine expenditures for special status species in the San Francisco Estuary comes from actions being undertaken by the CALFED program to protect and enhance their populations. Other potentially relevant information includes the value of foregone water diversions used to maintain instream flows critical to special status species. These programs are discussed in the following section.

B6-1.2 CALFED

The CALFED program represents a cooperative effort on the part of more than 20 Federal and State agencies that work collaboratively with local communities to implement projects that address specific goals within the four main objective areas of the program: ecosystem restoration, water quality, water supply and reliability, and levee system integrity.² CALFED has an adaptive management process that provides the various participating agencies and private citizens/organizations with extensive opportunities to review and comment on materials presented for the purposes of determining policy. The commitment of financial resources to the program through State and Federal sources — through a combination of general fund allocations, revenues from approved State bonds and department allocations, and with funds and resources provided by local/private sources — satisfies the first criterion that the project is undertaken voluntarily.

In addition to State and Federal agencies that serve on the Policy Group (as listed in footnote 2), many environmental and resource conservation groups, unions, Tribal governments, and municipalities serve on the CALFED Public Advisory Committee, as listed in Table B6-1.

Table B6-1: Organizations Represented on CALFED Public Advisory Committee	
<ul style="list-style-type: none"> ▶ The Bay Institute ▶ Ducks Unlimited ▶ Glenn County ▶ City Of West Sacramento ▶ Kern County Water Agency ▶ City of Rio Vista ▶ Inland Empire Utilities Agency ▶ Northern California Power Agency ▶ Friant Water Users Authority ▶ Contra Costa Water District ▶ Northern California Water Association 	<ul style="list-style-type: none"> ▶ United Farm Workers of America, AFL-CIO ▶ Association of California Water Agencies ▶ California Strategies, LLC ▶ Paskenta Band of Nomlaki Indians ▶ Plumas County ▶ Planning and Conservation League ▶ Natural Resources Defense Council ▶ San Luis & Delta-Mendota Water Authority ▶ Pacific Coast Federation of Fishermen's Association ▶ California Farm Bureau Federation ▶ Metropolitan Water District of Southern California

Source: CALFED website (accessed 11/27/02): http://calfed.ca.gov/BDPAC/BDPAC_Members.shtml (CALFED, 2001d).

The goal of the Public Advisory Committee is to provide assistance and recommendations to the Secretary of the Interior, the Governor of California, the California Legislature, and other interested entities through the CALFED Policy Group. The Committee also serves as a liaison between the program's workgroups, subcommittees, State and Federal agencies, and the general public.³

Numerous additional stakeholders are also represented at the subcommittee level. For example, the Ecosystem Restoration Subcommittee membership includes representatives from the organizations listed in Table B6-2.

² Participating Federal agencies include the Bureau of Reclamation, the Fish and Wildlife Service, the U.S. Geological Survey, the Bureau of Land Management, the Environmental Protection Agency, the Army Corps of Engineers, the Natural Resource Conservation Service, the U.S. Forest Service, the National Marine Fisheries Service, and the Western Area Power Administration. Participating State agencies include the Department of Water Resources, the California Department of Fish and Game (CDFG), The Reclamation Board, the Delta Protection Commission, the Department of Conservation, the San Francisco Bay Conservation and Development Commission, the State Water Resources Control Board, the Department of Health Services, and the Department of Food and Agriculture.

³ CALFED website (accessed 11/27/02): http://calfed.ca.gov/BDPAC/US_Dept_of_Interior_Charter.pdf (CALFED, 2001a).

Table B6-2: Stakeholder Organizations Represented on Ecosystem Restoration Subcommittee

▶ Central Valley Project Water Association	▶ Northern California Water Association
▶ Supervisor, District 4 Glenn County	▶ The Trust for Public Land
▶ Natural Heritage Institute	▶ MWD of Southern California
▶ Kern County Water Agency	▶ Save the Bay
▶ Mayor, City of Rio Vista	▶ Tribal Environmental Coordinator
▶ California Trout	▶ California Farm Bureau
▶ Friends of the River	▶ Environmental Defense Fund
▶ Friant Water Users Authority	▶ Matlock, Charles, Rowe & Co.
▶ Contra Costa Water District	

Source: CALFED website (accessed 11/29/02):

<http://calfed.ca.gov/BDPAC/Subcommittees/EcosystemSubcommitteeMembers.shtml> (CALFED, 2001b).

With feedback from the general public, an independent science advisory board, and various government agencies, this subcommittee developed the plan for habitat restoration in the San Francisco Bay-Delta.

In addition to stakeholder organizations represented on the various committees and subcommittees, there also is broad involvement of the general public. According to CALFED director Patrick Wright: “Public involvement has been one of the hallmarks of the program.”⁴ To ensure a thoroughly collective process, the general public is also strongly encouraged to participate through numerous subcommittees, workshops, and informational publications. The CALFED program was created to ensure that all interested parties were included in a collective process aimed at improving the water supply and restoring the Bay-Delta ecosystem.

The Sacramento River Conservation Area Forum (SRCAF) is another representative example of this inclusive process. Although not a government agency and having no regulatory power, the SRCAF was created over a decade ago to guide riparian habitat management along the river. The forum is convened monthly to facilitate discussion between landowners, government agencies, conservation groups, and the general public. The six non-voting members of the SRCAF board represent interested government agencies to share information on the progress of their restoration activities.⁵ Based on information presented to the board, only the voting members, which include landowners and other interested members of the public, make recommendations and issue opinions about whether these restoration activities are conducted according to the inclusive principles of the CALFED program and SRCAF mission.

This example, along with the overall structure of the CALFED process, is representative of a restoration program that reflects an attempt to form and implement a broad-based societal consensus. The program is based on the cooperative participation of government agencies and the inclusion of a broad cross section of stakeholders and the general public in the decision and funding process. Accordingly, restoration efforts developed under this collective decision-making process can be considered as expressions of revealed social preferences.

A second criterion to be satisfied for considering specific actions requires demonstration that the action was intended to benefit the resource in question. With respect to CALFED, it is clear that certain program elements, the categories of activity defined by CALFED, are focused on special status species. Specifically, the Ecosystem Restoration Program Plan (ERPP) has identified the following specific goals:⁶

- ▶ Recover 19 at-risk native species and contribute to the recovery of 25 additional species;⁷
- ▶ Protect and restore functional habitats, including aquatic, upland, and riparian, to allow species to thrive;

⁴ CALFED website (accessed 11/29/02): http://calfed.ca.gov/Newsroom/NewsReleases_2001/Newsrelease_10-22-01.shtml (CALFED, 2001c).

⁵ SRCAF website (accessed 12/8/02): http://www.sacramentoriver.ca.gov/publications/questions_to_date.pdf (SRCAF, 2002).

⁶ Source <http://calwater.ca.gov/Programs/EcosystemRestoration/Ecosystem.shtml>, accessed 6/23/03 (CALFED, 2003).

⁷ Among the species in this combined group are the following: delta smelt, longfin smelt, green sturgeon, Sacramento splittail, Sacramento winter-run chinook salmon, Central Valley spring-run chinook salmon, late-fall-run chinook salmon, fall-run chinook salmon, and Central Valley steelhead (see CALFED Ecosystem Restoration Plan) (CALFED, 2000).

- ▶ Maintain and enhance fish populations critical to commercial sport and recreational fisheries;
- ▶ Improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish;
- ▶ Rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains, and ecosystem water quality; and
- ▶ Reduce the negative impacts of invasive species and prevent additional introductions that compete with and destroy native species.

It is clear that the goals of the ERPP are focused, at least in part, on special status species. The Environmental Water Account program element within CALFED also includes actions undertaken to protect fish and habitats in addition to the regulatory actions required for project operations.

B6-1.3 Values for Water in California

“Restoration” programs need not be relied on exclusively to infer societal revealed WTP to preserve special status species. In many instances, other programs or restrictions are used in lieu of (or in conjunction with) restoration programs, and the costs associated with the nonrestoration components also reveal a WTP. For example, efforts to preserve fish species in the San Francisco Estuary also include water use restrictions that reduce the amount of fresh water diverted from the upstream portion of the Sacramento River to highly valued water uses in the central and southern parts of California. The foregone use values of these waters in agricultural and municipal applications are an important component of the cost society bears to protect and preserve special status fish species.

Several actions have been taken in northern California to increase stream flows to improve fish habitat. The most significant reduction in water use to meet these increases in stream flows has been experienced by urban and agricultural water users who obtain their supplies from the Bureau of Reclamation. The Bureau has had to cut back on supply to its Central Valley Project (CVP) customers to comply with the various water needs and restrictions of the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA), the CVP Improvement Act (CVPIA), and the new Bay-Delta water quality standards issued in 1995 by the State Water Resources Control Board. For these purposes, the Bureau has reduced by 40 to 60 percent its usual 7 million AF per year delivered to water users without water rights (personal communication, Earl Cummings, California Division of Water Resources, Environmental Services Office, March 2000; personal communication, Jeff Sandberg, Central Valley Project, March 2000). Thus, the Bureau has foregone 3 to 4 million AF per year for environmental water use intended for the Sacramento and San Joaquin rivers to protect special status species. EPA estimated that this represents a range of value to California water users from \$155 to \$425 per AF (the calculation is explained in Appendix B2), and is a weighted average reflecting agricultural and municipal uses. Using this estimate, the value to California water users of the water the Bureau has foregone ranges from \$484 million to \$1.8 billion annually in 2002 dollars.

EPA contacted the Bureau of Reclamation to verify the amount of water being diverted for special status species under the context of the CVPIA and bay delta water quality standards. Although the Bureau could not estimate the amount of water diversion cut back specifically for special status species, they estimated that approximately 50 percent of the water diverted for the CVPIA and the Bay-Delta water quality standards is to preserve or enhance the targeted fish populations through water quality or other habitat improvements (personal communication, Jeff McCracken, Public Information Office, Bureau of Reclamation, June 2003).

B6-1.4 Conclusions

EPA did not use the method described in this section in its benefits analysis for the final section 316(b) Phase 2 rule because of uncertainties about the percent of program funding assigned to the protection of special status species. Nonetheless, EPA believes this method holds promise.

B6-2 AN EXPLORATION OF BENEFITS TRANSFER TO ESTIMATE NON-USE BENEFITS OF REDUCED I&E IN NORTHERN CALIFORNIA

This section presents a benefits-transfer methodology explored by EPA to estimate public WTP for protection of special status fish species from I&E at the Pittsburg and Contra Costa power plants. The analysis focuses on four special status species affected by I&E: delta smelt, longfin smelt, Sacramento splittail, and chinook salmon.

B6-2.1 Benefit Transfer Approach

Case-specific estimates of non-use values for the protection of special status species can only be derived by primary research using stated preference techniques (e.g., the contingent valuation method). However, the cost, administrative burden, and time required to develop primary research estimates is beyond the schedule and resources available to EPA for the section 316(b) rulemaking. As an alternative, EPA explored a benefit transfer approach that relies on information from existing studies (U.S. EPA, 2000). Boyle and Bergstrom (1992) define benefit transfer as “the transfer of existing estimates of nonmarket values to a new study which is different from the study for which the values were originally estimated.”

There are four types of benefit transfer studies: point estimate, benefit function, meta-analysis, and Bayesian techniques (U.S. EPA, 2000). The point estimate approach involves taking the mean value (or range of values) from the study case and applying it directly to the policy case (U.S. EPA, 2000). This approach may be used to transfer estimates of values for preserving certain endangered species in one region to another region or to another species. A conceptually preferred benefits transfer approach is to use the benefit function transfer approach, which is more refined but also more complex than the point estimate approach. If the study case provides a WTP function, valuation estimates can be updated by substituting applicable values of key variables, such as baseline risk and population characteristics (e.g., mean or median income, racial or age distribution) from the policy case into the benefit function (U.S. EPA, 2000).

Ideally, transfer studies would be available that value special status species that are identical to the species affected in the San Francisco Estuary. EPA, however, was unable to identify such studies. Thus, the Agency selected benefits transfer studies that valued aquatic species that have attributes similar to the affected species. One of the most important attributes to consider is whether the affected species have any use values. As shown in Table B6-3, the majority of I&E losses of special status species are associated with forage species that do not have direct use values.

Table B6-3: Comparison of Special Status Species Losses to I&E with Target Abundance in Bay-Delta Region

Special Status Fish Species	Type of Value	Current Population ^a	Total Baseline I&E Losses		I&E Losses as % of Current Population
			Number of Fish	Species Loss as % of Total I&E Loss of Special Status Species	
Delta smelt	Non-use	334,855	753	8.8%	0.2%
Longfin smelt	Primarily non-use	636,225	6,824	79.8%	1.1%
Sacramento splittail	Primarily non-use	7,973	911	10.6%	11.4%
Chinook salmon (all runs)	Use and non-use	301,877	67	0.8%	0.0%
Total	-	1,280,930	8,555	100.0%	0.7%

^a Current abundance is equal to the median value for the period 1990-2000 or the median of the most recent values available from 1990 onward. See Appendix B3 for details.

Of the four special status species only one, chinook salmon, has high direct use values. The remaining three species — delta smelt, longfin smelt, and Sacramento splittail — have primarily non-use values. There are no known recreational or consumptive uses for the delta smelt. The longfin smelt is fished occasionally and it has also been sold seasonally at fish markets, but neither use appears to be widespread. Before the Sacramento splittail was listed as a threatened species it was used as bait for striped bass anglers, but not to a large extent (Federal Register, 1999). Given that I&E losses of chinook salmon represent only 0.8 percent of total I&E losses of special status species in the San Francisco Estuary, EPA focused on economic studies valuing preservation of obscure forage species in identifying benefit transfer candidates.

The Agency identified two studies that valued special status species that match closely characteristics of the species affected by I&E in the San Francisco Estuary. Boyle and Bishop (1987) found that citizens of Wisconsin are willing to pay \$7.52 (2002\$) to preserve the striped shiner, a small minnow of the Milwaukee River (which is listed by the State of Wisconsin as

endangered, but is not listed as a Federally threatened or endangered species).⁸ A study by Berrens et al. (1996) found that preservation of the endangered silvery minnow in New Mexico would be worth an average of \$8.32 (2002\$) per household per year.⁹

EPA considered using the point estimate approach to derive a range of WTP values for improving protection of the four special status species in the San Francisco Estuary. Neither the Boyle and Bishop (1987) nor the Berrens (1996) study contained sufficient or relevant information for applying any of the more elaborate benefits transfer techniques. Boyle and Bishop (1987) did not estimate a function which itself may be transferable to other regions. They obtained WTP values by asking citizens if they would accept or reject fixed membership fees to join a foundation that would conduct the necessary activities to preserve the species in question and reported the estimated results but not a regression function. Therefore, the benefit function transfer approach is not a feasible alternative using the Boyle and Bishop (1987) study. The Berrens et al. (1996) study also does not lend itself to benefits function transfer.

Using the two studies described in the preceding section and applying a range of the per taxpayer WTP to protect the striped shiner and silvery minnow to the 2000 population of California, it is possible to estimate WTP to prevent extinction of the delta smelt and other Federally-listed special status fish species in California.

Because I&E at the Pittsburgh and Contra Costa plants is only one of several factors that cause decline of the delta smelt, longfin smelt, Sacramento splittail, and chinook salmon populations, the societal benefit achieved from preventing all I&E losses at these two plants is lower than the benefit of reducing the risk of species extinction to zero. Thus, one would assign a fraction of the non-use estimates for species preservation programs based on the percent of the estimated standing stock that is adversely impacted under the baseline level of I&E losses. As shown in Table B6-3, the estimated impact of I&E amounts to 0.7 percent of the estimated current population of the special status species in the Bay-Delta area.

EPA notes, that although the Agency explored this approach to estimate non-use values of improved protection of the four special status species in the San Francisco Estuary, benefits based on this method were not included in the final section 316(b) rule benefit cost analysis due to the uncertainty and limitations discussed in Section A13-6.1 of this report.

EPA would like to further note the encouraging point that the valuation results are highly consistent across the relevant T&E studies available in the literature. As more studies become available, it may be possible to obtain insights into the effects of various variables (e.g., population and resource characteristics) and develop welfare estimates that may be adjusted for the attributes of the policy or region under consideration. For example, researchers and policy makers have placed increasing focus on meta-analysis and similar empirical approaches to improve the performance of benefit transfer in policy analysis.

⁸ The original WTP amount was converted to 2002\$ using the Consumer Price Index (CPI) obtained from U.S. Department of Labor Bureau of Labor Statistics (U.S. Bureau of Labor Statistics, 2003).

⁹ Berrens estimated a \$28/year per household (1995\$) WTP for a 5-year program. To place it on an equivalent basis to Boyle and Bishop, the 5-year payment needs to be converted to an equivalent annual payment over a longer time frame. Using a 25-year payment period and a 3 percent discount rate to convert the Berrens 5-year result to 25 years, and using the CPI to update from 1995\$ to 2002\$, the result of \$8.32 (2002\$) per household per year is derived. The 25-year period is used by EPA as a reasonable proxy for a longer-term indefinite period as implied by the other studies, because typical median aged household heads probably would not envision paying appreciable taxes or contributions after 25 or 30 years (i.e., past age 70).